UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

February 12, 2013

MEMORANDUM

SUBJECT: Recommendations for Use of XRF and Sieving of Soils
35th Avenue Superfund Site, Birmingham, Alabama

FROM: Glenn Adams, Chief
Technical Services Section
Superfund Support Branch

TO: Jeffery Crowley, On-Scene Coordinator,
Emergency Response and Removal Branch

As you have requested, the Technical Services Section (TSS) has reviewed the data you provided. We reviewed the results of lead and arsenic data comparing laboratory data to XRF data and/or the data from soil samples that were sieved and unsieved. Currently, the sampling and analysis protocol being followed at the 35th Avenue site is to take XRF readings of all samples and then sieve the sample and take another XRF reading and then send 10% of samples to a laboratory for lab analysis. This review was to help determine if sieving and laboratory analysis at this level is still needed. Below are TSS's recommendations after doing a statistical analysis of this data and concentrating on the specific data points close to the Removal Management Levels (RMLs) for lead and arsenic.

TSS has reviewed the data provided by the OSC and based on our review and the statistical analysis performed (see attached analysis), data within +/- 200 mg/kg of the lead RML, the lab and XRF data are positively correlated (correlation coefficient = 0.74). There was a similarly strong correlation between the sieved and un-sieved data (correlation coefficient = 0.74).

Just looking at the statistical analysis of this data, it could be concluded that sieveing and laboratory data may not be necessary to make removal decisions with a reasonable degree of confidence. Yet when you focus on the lead data in these comparisons just above or just below the RMLs and determine if the differences in the sample preparation and/or data analysis would have resulted in a different decision for some residential yards. There is data

that would show exceedances of RMLs in the lab data and/or sieved data that are not shown when just using the XRF and/or un-sieved data.

The issues identified with the use of XRF and un-sieved arsenic data seem to be present in XRF results above the RML and just above and just below the RML for lead data. Since each of these data points typically represent all or part of a residential yard, more consideration needs to be given to the raw data than just using the statistical analysis alone. TSS recommends the following procedures to provide a higher level of confidence in the data used for decision making.

Recommendations for future Lead and Arsenic data/samples: Based on the data and the observations stated above, TSS recommends that any samples with XRF readings of lead between 200 mg/Kg and 600 mg/Kg should be sieved and sent to the lab for metals analysis. For arsenic, any XRF readings above 40 mg/Kg should be sieved and sent to the lab for metals analysis. The exception for arsenic can be when you have XRF lead data above 600 mg/Kg in the same sample, no further arsenic data typically would be needed because of the high lead concentrations which would drive the cleanup already. Typically, the sieved and lab data should be used as the main data set for your decision making, but there may be site specific situations that alter the typical procedure.

TSS recommends that lead concentrations in un-sieved samples greater than 600 mg/Kg and less than 200 mg/Kg can be used without needing to be sieved or sent to the lab. TSS also recommends that un-sieved samples with arsenic concentrations less than 40 mg/Kg can be used without needing to be sieved or sent to the lab.

Please let me know if you have any questions or if there is anything additional you need. We can be available for a conference call to discuss this information at your convenience. You can reach me at 404-562-8771 if you have any questions.

ATTACHMENT

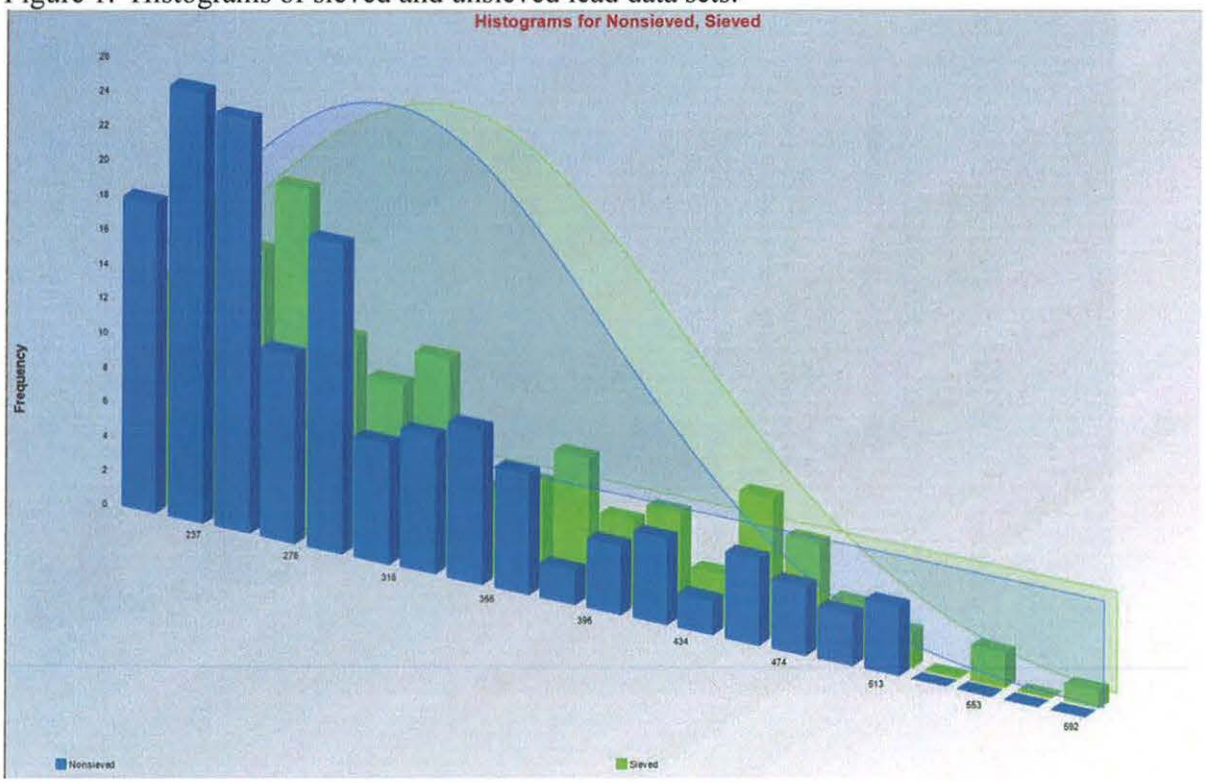
Summary statistics are presented in Table 1 for the un-seived and sieved soil lead data. The summary data show that the measures of central tendency (mean/median) are similar and that the coefficients of variation, a measure of variability within each data set, are essentially identical for the data sets.

Table 1. Summary statistics for unsieved and sieved lead data sets.

Variable	N =	Mean	Median	CV
Un-Sieved	156	306	280	0.285
Sieved	156	325	296	0.29

A histogram of the two data sets shows that the distribution of the lead data sets appears to be very similar. (Figure 1)

Figure 1. Histograms of sieved and unsieved lead data sets.



Summary statistics are presented in Table 2 for the XRF and laboratory soil lead data. The summary data show that the measures of central tendency (mean/median) are higher for the samples analyzed in the lab. The coefficients of variation, a measure of variability within each data set, however are very similar for the data sets.

Table 2. Summary statistics for XRF and lab lead data sets.

Variable	N =	Mean	Median	CV
Lab	34	395	410	0.257
XRF	34	348	325	0.279

A histogram of the two data sets shows that the distribution of the data appears to have a similar shape, but the lab data are shifted slightly higher. (Figure 2) It is possible that these data would more closely mirror one another if the number of data points increased.

Figure 2. Histograms of lab and XRF lead data sets.

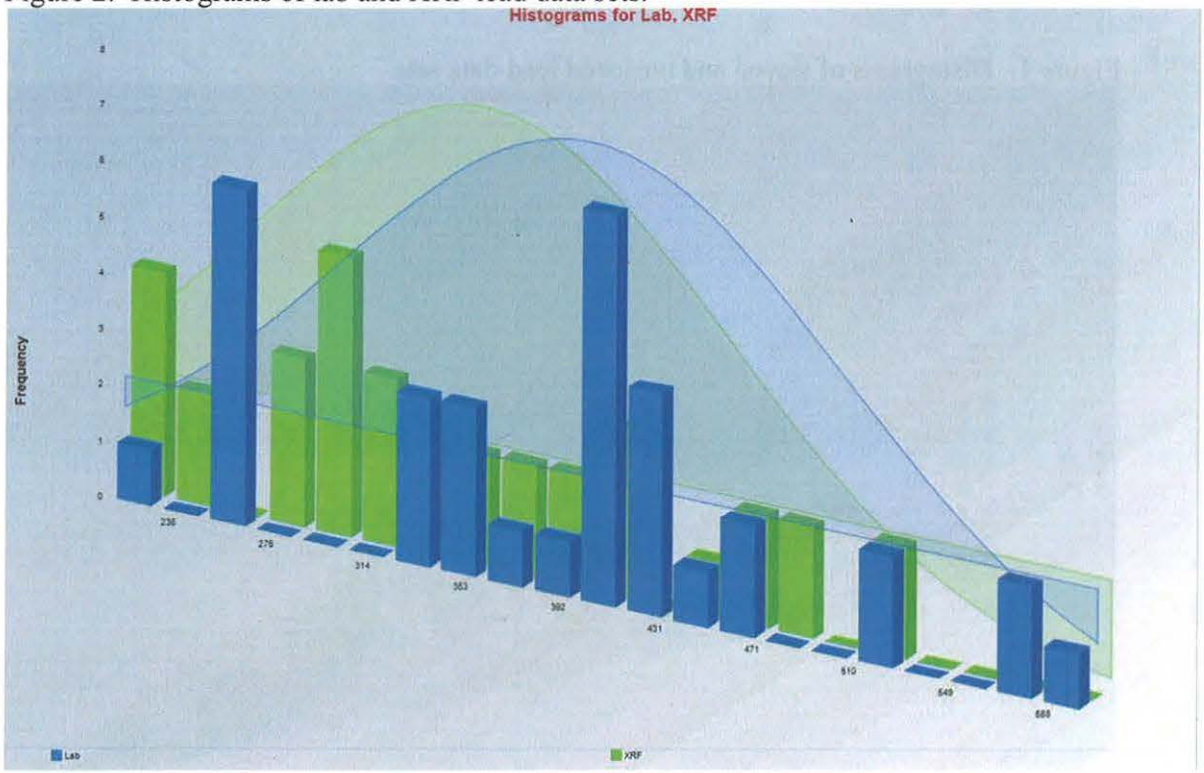
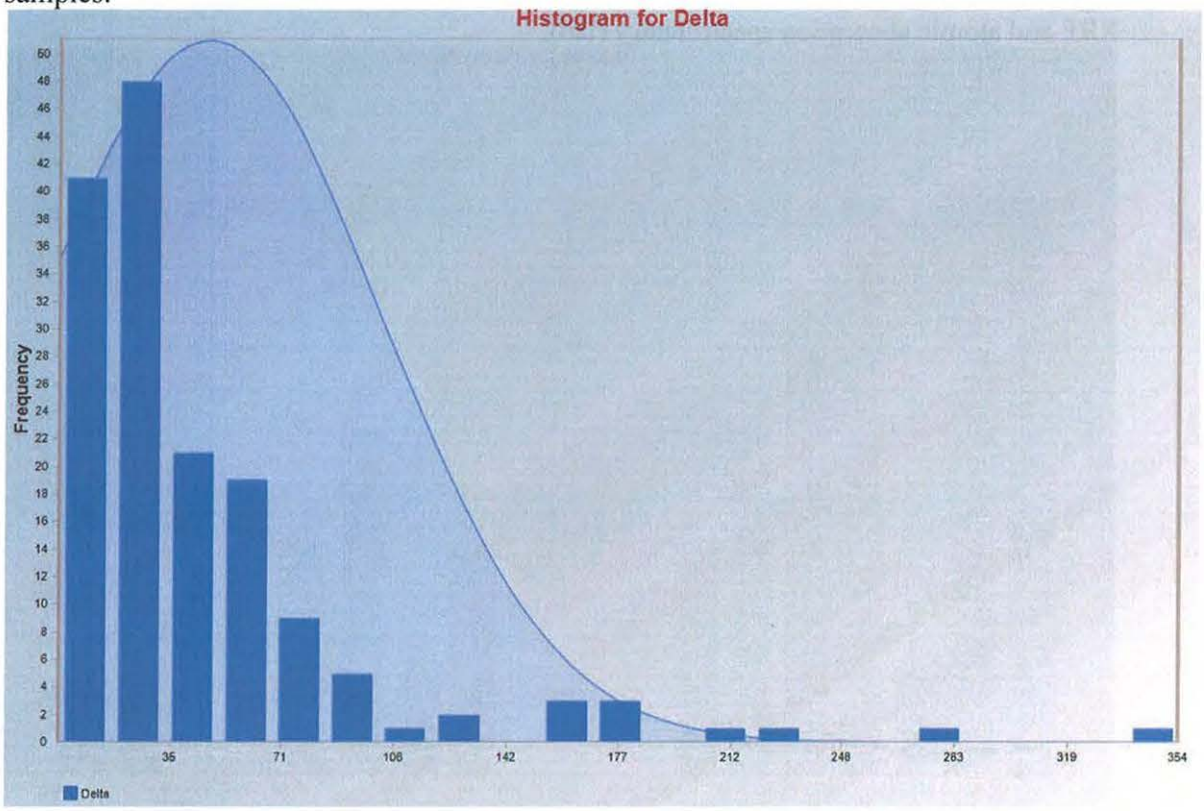


Figure 3 is a histogram of the absolute difference (delta) between the sieved and unsieved soil sample lead concentration data (n=156). The histogram shows that the difference was less than (+/-) 200 mg/kg in all but four samples. (Figure 3)

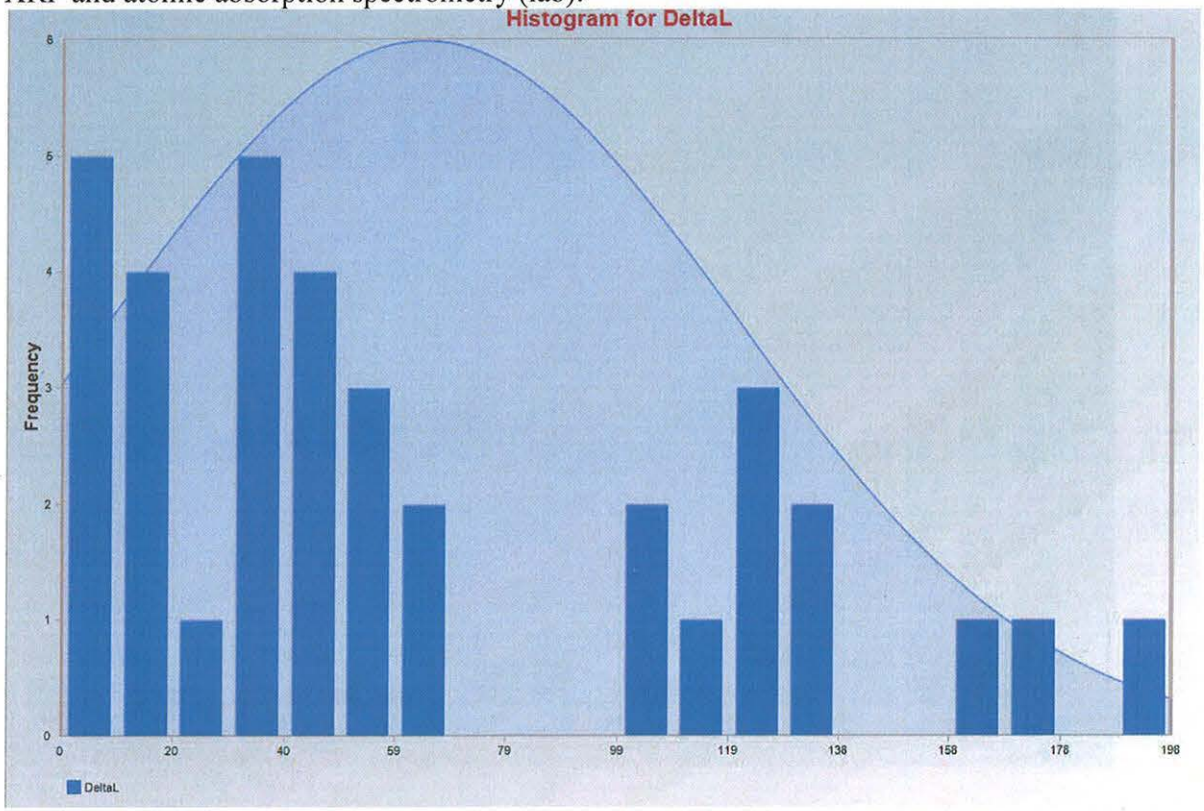
Figure 3. Absolute difference (delta) in lead concentrations the sieved and unsieved soil samples.



The data were also evaluated to determine when a potentially different decision would result depending on the type of sample preparation. In cases where the unsieved sample resulted in a concentration > 400 mg/kg of lead, there were only six instances where the corresponding sieved sample resulted in a concentration less than 400 mg/kg. In cases where the sieved samples were > than 400 mg/kg, there were fifteen instances where the unsieved sample was less than 400 mg/kg.

Figure 4 is a histogram of the absolute difference (delta) between samples analyzed in the field (XRF) and soil samples analyzed in the lab. The histogram shows that the difference was less than (+/-) 200 mg/kg in all sample pairs. (Figure 4)

Figure 4. Absolute difference (delta) in lead concentrations between samples analyzed by XRF and atomic absorption spectrometry (lab).



The data were also evaluated to determine when a potentially different decision would have been made depending on the type of sample analysis. In cases where the lab sample resulted in a concentration > 400 mg/kg of lead, there were ten instances where the corresponding XRF sample resulted in a concentration less than 400 mg/kg. In cases where the XRF samples were greater than 400 mg/kg, the corresponding lab sample was less than 400 mg/kg in only a single sample. .